CLAIMS:

1. A process for the recovery of nickel and/or cobalt from an impure nickel, cobalt or mixed nickel/cobalt material including the steps of:

a) providing a nickel, cobalt or mixed nickel/cobalt material; and

b) contacting the nickel, cobalt or mixed nickel/cobalt material with a feed ammoniacal ammonium carbonate solution and a reductant in a leach step.

2. A process according to claim 1, wherein the nickel, cobalt or mixed nickel/cobalt material is either a nickel, cobalt or mixed nickel/cobalt hydroxide, carbonate, basic carbonate or basic sulphate material.

3. A process according to claim 1 or 2, wherein the nickel, cobalt or mixed nickel/cobalt material is a mixed nickel/cobalt hydroxide material.

4. A process according to any one of claims 1 to 3, wherein the feed ammoniacal ammonium carbonate solution is a process liquor from a Caron type process.

5. A process according to any one of the preceding claims, wherein the reductant is selected from hydroxylamine, a mixed cobalt/nickel sulphide or cobalt sulphide.

6. A process according to claim 5, wherein the reductant is a mixed cobalt/nickel sulphide.

7. A process according to claim 6, wherein the mixed cobalt/nickel sulphide is produced by contacting a cobalt/nickel containing ammoniacal ammonium carbonate solution with ammonium hydrosulphide or sodium hydrosulphide, to precipitate a mixed cobalt/nickel sulphide.

8. A process according to claim 7, wherein the cobalt/nickel containing ammoniacal ammonium carbonate solution is a portion of the

process liquor of a Caron type process used as the feed ammoniacal ammonium carbonate solution, or a portion of any selected cobalt/nickel containing process liquor.

9. A process according to claim 6 wherein the mixed cobalt/nickel sulphide is used as the reductant in the leach step.

10. A process according to any one of the preceding claims wherein the feed ammoniacal ammonium carbonate solution and the cobalt/nickel containing ammoniacal ammonium carbonate solution contain 8 to 16% by wt ammonia, 4 to 12% by wt carbon dioxide, 0.5 to 1.5% by wt nickel and 0.02 to 0.2% by wt cobalt.

11. A process according to any one of the preceding claims wherein the mixture of the nickel, cobalt or mixed nickel/cobalt material, the feed ammoniacal ammonium carbonate solution and reductant is agitated.

12. A process according to claim 11 wherein the mixture is agitated for a period of from 30 minutes to 12 hours at a temperature of from 30 to 90°C at atmospheric or elevated pressure.

13. A process according to claim 12 wherein air or oxygen containing gas is injected into the mixture after a period of at least 10 minutes anaerobic agitation.

14. A process for the recovery of nickel and/or cobalt from a nickel, cobalt or mixed nickel/cobalt material including the steps of:

a) providing a nickel, cobalt or mixed nickel/cobalt material;

b) contacting the nickel, cobalt or mixed nickel/cobalt material with a feed ammoniacal ammonium carbonate solution in a primary leach step to produce a product solution containing the majority of the nickel and cobalt and a residue;

c) separating the residue from the product solution; and

d) contacting the residue with fresh ammoniacal ammonium carbonate solution and a reductant in a secondary leach step to produce a secondary product solution containing the dissolved nickel and cobalt and a secondary leach residue.

15. A process according to claim 14, wherein the nickel, cobalt or mixed nickel/cobalt material is either a nickel, cobalt or mixed nickel/cobalt hydroxide, carbonate, basic carbonate or basic sulphate material.

16. A process according to claim 14 and 15, wherein the material is a mixed nickel/cobalt hydroxide material.

17. A process according to claim 14 wherein the feed ammoniacal ammonium carbonate solution is a process liquor from a Caron type process.

18. A process according to claim 14 wherein the secondary product solution is returned and combined with the feed ammoniacal ammonium carbonate solution for the primary leach step.

19. A process according to claim 14 including the further step wherein the secondary leach residue is subjected to a third leach step by subjecting the secondary leach residue to prolonged contact with a strong ammoniacal ammonium carbonate solution.

20. A process according to claim 19, the strong ammoniacal ammonium carbonate solution contains 8 to 16 wt% ammonia, 4 to12 wt% carbon dioxide, 0 to 1.0 wt% nickel, and 0 to 0.1 wt% cobalt.

21. A process according to any one of claims 14 to 20 wherein the reductant is selected from hydroxylamine, a mixed cobalt/nickel sulphide or cobalt sulphide.

22. A process according to claim 21 wherein the reductant is a mixed cobalt/nickel sulphide.

23. A process according to claim 21 wherein the mixed cobalt/nickel sulphide is produced by contacting a cobalt/nickel containing ammoniacal ammonium carbonate solution with ammonium hydrosulphide or sodium hydrosulphide to precipitate a mixed cobalt/nickel sulphide.

24. A process according to claim 23, wherein the cobalt/nickel containing ammoniacal ammonium carbonate solution is a portion of the process liquor of a Caron type process used as the feed ammoniacal ammonium carbonate solution, or a portion of any selected cobalt/nickel containing process liquor.

25. A process according to any one of claims 14 to 24 wherein the feed ammoniacal ammonium carbonate solution and the cobalt/nickel containing ammoniacal ammonium carbonate solution contains 8 to 16% by wt ammonia, 4 to 12% by wt carbon dioxide, 0.5 to 1.5% by wt nickel and 0.02 to 0.2% by wt cobalt.

26. A process according to claim 14 wherein the fresh ammoniacal ammonium carbonate leach solution for the secondary leach step contains from 8 to 16% by wt ammonia and 4 to 12% by wt carbon dioxide with only trace amounts of nickel and cobalt.

27. A process according to claim 14 wherein the mixture of the fresh ammoniacal ammonium carbonate leach solution, the residue of the primary leach step and the reductant is agitated.

28. A process according to claim 27 wherein the mixture is agitated for a period of from 30 minutes to 12 hours at a temperature of from 30 to 90°C at atmospheric or elevated pressure.

29. A process according to claim 28 wherein air or oxygen containing gas is injected into the mixture after a period of at least 10 minutes anaerobic agitation.

30. A process according to claim 22, wherein the mixed cobalt/nickel sulphide is used as the reductant in the secondary leach step.

31. A process according to claim 1, substantially as herein before described with reference to any one of the Examples and Figure 1.

32. A process according to claim 12, substantially as herein before described with reference to any one of the Examples and Figure 2.